Remarks

Summary of Rejections

In ¶2 of the Office Action, claims 1-10 are rejected under §103(a) as unpatentable over U.S. Patent 5,027,582 to Shahani, et al., (Shahani).

In ¶3 of the Office Action, claims 1-10 are further rejected under §103(a) as unpatentable over a combination of Shahani and U.S. Patent 5,277,719 to Kuhlman, et al. (Kuhlman).

In ¶4 of the Office Action, the Examiner has indicated that a showing that the claimed invention shows unexpected results when compared with prior art that is more closely related to the claimed invention than the art cited by the Examiner would be considered persuasive evidence of non-obviousness, and has invited applicants to submit evidence or argument on this point.

In this regard, claims 1 and 4-9 are amended herein, while claims 2, 3, and 10 are withdrawn.

Legal Precedent Regarding Sections 103

Under § 103, a patent may not be obtained though the invention is not identically disclosed or described as set forth in §102 if the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. 35 U.S.C. § 103(a). In determining differences between the prior art and the claims, the question under

section 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530 (Fed. Cir. 1983). Moreover, the prior art must also be considered as a whole, including disclosures that would teach away from the claimed invention. *W.L. Gore & Associates, Inc., v. Garlock, Inc.*, 721 F.2d 1540 (Fed. Cir. 1983).

The language "obvious at the time the invention was made" has been held by the Courts to mean that it is inappropriate for the Examiner to use "hindsight" in determining obviousness. *Panduit Corp. v. Dennison Mfg. Co.*, 774 F.2d 1082 (Fed. Cir.1985). The Court in *In re Vaeck* held that "a proper analysis under § 103 requires, inter alia, consideration of two factors: (i) whether there is some suggestion or motivation, either in the reference themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings and (ii) whether the prior art would have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success. Both the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in the applicant's disclosure". *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991).

With respect to instances where ranges disclosed in the prior art overlap those delineated in the claims, although it has been held that such overlap may

support the existence of a *prima facie* case of obviousness, such a *prima facie* case is rebutted by a showing of the criticality of the range, i.e. that the claimed ranged achieves an unexpected result relative to the prior art. *In re Woodruff*, 919 F.2d 1575 (Fed. Cir. 1990). The *prima facie* case may also be rebutted by a showing that the art, in any material way, teaches away from the claimed invention. *In re Geisler*, 116 F.3d 1465, 1471 (Fed. Cir. 1997); see MPEP §2144.05 III.

Summary

Applicant herein amends the claims to better describe the inventions relationship to the 7055 alloy and submits that the 7055 alloy, as described in US Patent 5,221,377, (Hunt, et al., attached) is more closely related to the present invention than the art cited by the Examiner (i.e. Shahani, et al. and Kuhlman, et al.). Given this relationship, applicants submit that the examiner should use the teachings of the Hunt'377 as the closest prior art to the present invention, particularly since those of ordinary skill would know from reading Hunt'377, as well as Shahani and Kuhlman, that Hunt'377 is the more relevant disclosure and provides teachings more applicable than those found elsewhere. Finally, Applicants herein maintains their arguments on the criticality of the claimed ranges and the surprising results relative to the closest prior art, Hunt'377. These arguments were presented in full in Applicant's prior response, which is incorporated herein by reference.

A. **A Comparison of Alloying Elements Demonstrates that 7055 is the Proper Bench-mark for the Unexpected Results Produced by the Invention as Claimed**

1. Table 1 below is a comparison of the composition limits of the standard 7055 alloy as registered and the alloy as described in claim 1. The information is taken from the table found in the instant specification on page 5.

Table I

Composition Limits of Standard 7055 Alloy, the Alloy Taught by Hunt and the Invention Alloy

	Si	Fe	Cu	Mg	Zn	Zr
Standard 7055	0.10 max	0.15 max	2.0 – 2.6	1.8 – 2.3	7.6 – 8.4	.08 – 0.25
Hunt, et al., col. 2, 4-14	***0.15 individually, total up to 0.4 or 0.5 (See below)***		2.0 – 2.6	1.8 – 2.3	7.6 – 8.4	.08 – 0.25
Invention Alloy	0.01 – 0.06	0.01 – 0.09	2.0 – 2.6	1-8 – 2.3	7.6 – 8.4	0.08 – 0.25

2. As noted in the office action and in the instant specification, standard AA7055 is disclosed by U.S. Patent 5,221,377 to Hunt, et al. (Hunt '377). Note also, the instant specification uses the AA 7055 alloy described in Hunt'377 as the benchmark to show the surprising and unexpected improvements obtained by the present invention.

3. In the prior rejection, the examiner has relied upon the disclosures of Shahani (US patent 6,027,582) and Kuhlman (US Patent 5,277,719) in the belief that these patents represent the art most relevant to the instant invention. As indicated by the table below, on the one hand Shahani teaches an alloy with less Cu (as well as a theory that appears to require a set Cu/Mg ratio). On the other hand, Kuhlman teaches a pre-forging technique for 7XXX alloys used for thick plate products, i.e. a forging step prior to rolling for thick plate products, and discloses that the improvement in mechanical properties when plate products are pre-forged using its technique increases with lowered Fe and Si levels. See Kuhlman, claim 1. Neither of these patents is as relevant as the Hunt'377 patent which specifically describes the properties of the 7055 alloy known to those of ordinary skill.

	Si	Fe	Cu	Mg	Zn	Zr
Shahani	0.11 max	0.14 max	**1.2 – 2.2**	1.7– 2.5	5.7 – 8.7	0.05 – 0.15
Kuhlman	**0.50 max**	**0.50 max**	about 1-3	0.9 – 2.85	1 – 9.5	0.3 max
Invention Alloy	**0.01 – 0.06**	**0.01 – 0.09**	**2.0 – 2.6**	1-8 – 2.3	7.6 – 8.4	0.08 – 0.25

4. According to Hunt'377, the mechanical properties of the 7055 alloy are not particularly related to Si and Fe levels. AA7055 does not need to have low Fe or Si to maintain good mechanical properties and "the measured fracture toughness values for alloy products containing about 0.05 iron and 0.05 silicon were similar to those values for alloys containing about 0.15% each of these impurities.... The [7055] alloy was found to offer surprisingly less sensitivity to variations in the

tolerable amounts of these two impurities at levels below 0.15%. " Hun'377, col. 5, lns 8-26, Emphasis added. In short, the specific teachings regarding the AA7055 alloy are that Si and Fe need not be lowered below 0.15wt% to achieve peak mechanical property performance.

5. Hunt'377 additionally teaches that high iron and silicon levels are appropriate for 7055 alloy products, that "Although total iron plus silicon contents of about 0.2 or 0.25 are preferable, it is also possible for the invention alloy to accommodate cumulative iron plus silicon concentrations up to about 0.4 or 0.5%. Id. col 5, 24-31.

6. As should be noted, Hunt'377 expressly contradicts and teaches away from the teachings of Kuhlman on this point, so that the combination of Kuhlman and Hunt'377 would be categorically improper.

7. In contrast, the instant case involves the discovery, contrary to Hunt's teachings, that Fe and Si levels are critically important to fatigue failure resistance in 7055 type alloys:

> The invention alloy possesses surprising, significantly enhanced fatigue performance associated with Si and Fe compositional changes when compared with alloy 7055. The inventors have discovered that an improvement in the invention alloy fatigue failure resistance is associated with decreasing fatigue initiation by Mg_2Si particles. When Si concentration is maintained below about 0.06%, particularly below about 0.04%, the usually observed Mg_2Si in this alloy system is absent or almost absent, thereby significantly delaying the onset of fatigue." App. ¶25 (as amended herein)

8. The application further describes how it was discovered that Mg_2Si particle initiation and Fe particle initiation are the primary fatigue failure modes in the 7000 series of alloys, "Mg_2Si particle initiation is the easiest, Fe bearing particle initiation is more difficult and lattice slip is the most difficult." App. ¶ 26. These teachings are found nowhere in Hunt'377, nor in Shahani or Kuhlman.

9. Applicant submits that these teachings regarding the critical function of the low Fe and Si ranges for the 7055 AA alloy and the resultant surprising improvement in fatigue strength contradict the teachings and understanding in the art regarding the relative unimportance of Fe and Si in the 7055 alloy system.

10. Surprising results for the present invention are also found and validated by the test data disclosed in the application, test data that establishes the surprising improvement in mechanical properties attained by the inventive alloy.

11. In comparative testing with the 7055 alloy at the T7751 temper, for a given stress level, the improvement in sample life compared to an identically prepared 7055 sample was 645% improvement in sample life. Correspondingly, for a given lifetime of 100,000 test cycles, the inventive alloy withstood a stress level of 224 MPa, while the 7055 alloy exhibited failure at 190 MPa, representing a significant 18% increase in fatigue strength. App. ¶39.

12. In addition, in comparative testing between the inventive alloy and 7055 alloy plate, aged to the T79XX temper, surprising improvements in lifetime (144%) and strength (9%) were demonstrated.

13. Finally, in comparative testing with the 7055 T7751 alloy for load transfer joint fatigue, using experimental samples that were designed to simulate a skin-to-stringer component in a commercial aircraft wing cover, lifetime improvements over comparative 7055 samples ranged from 57% improvements to 105% improvements upwards to a 162% improvement for a variety of conditions. ¶App. ¶46-48. In short, the inventive alloy as claimed attains a surprising and significant improvement in fatigue resistance properties across multiple tempers and part designs, and these improvements are directly related to the ranges of alloying elements in the claims.

B. Responses to the Final Office Action

Paragraph 2 of the Office Action-- Claims 1-10 --Shahani et al.

14. Claims 2, 3 and 10 are herein withdrawn. Claims 1, 4-9 are pending, and have been amended to better indicate the relationship between the present invention and AA7055, and obviating the prior rejection.

15. According to the office action, "Shahani teaches a rolled, forged, or extruded aluminum alloy >60 mm thick... suitable for structural elements of aircraft comprising (in weight%): 5.7-8.7% Zn, 1.7-2.5% Mg, 1.2-2.2% Cu, <0.14% Fe, <0.11% Si, 0.05-0.15% Zr, balance aluminum..." Office Action, ¶1.

16. However, Shahani teaches that its preferred alloys possess "commercial contents of iron and silicon..." Shahani, col. 4, ln. 65. Shahani does not teach or imply the existence of a relationship between fatigue failure resistance and Fe/Si amounts.

17. As taught by Hunt'377, appropriate commercial quantities of Fe and Si may be up to 0.40 or 0.5 wt.% total, so that the teachings of Shahani, with regard to 7X55 type alloys, would similarly be for greater amounts of Fe and Si than those of the present invention.

18. Thus, Shahani does not by itself render the invention obvious as it teaches away from the present invention. In addition, nor can it be combined with Hunt'377, as Hunt '377 further teaches away from the present invention.

19. Accordingly, Applicants respectfully request that the rejection of claims in paragraph 2 be withdrawn.

Paragraph 4 of the Office Action -- Claims 1-10 -- Shahani in light of Kuhlman

20. Claims 2, 3 and 10 are herein withdrawn. Claims 1, 4-9 are pending, and have been amended to better indicate the relationship between the present invention and AA7055, and obviating the prior rejection.

21. As described above, the invention as claimed when read in light of the specification shows the criticality of the ranges of alloying elements and the lower amounts of Fe and Si compared to the levels known to be appropriate for AA7055 type alloys.

22. In addition, Shahani teaches away from the claimed inventive ranges, in that it supports commercial levels of Fe and Si and lower levels of Cu than those surprisingly found to provide improved mechanical properties (i.e. fatigue resistance) in the present invention. This commercial range, as seen in Hunt'377, is up to 0.4 or 0.5 combined. Thus any *prima facie* case based on the overlap in the ranges of alloying elements is rebutted.

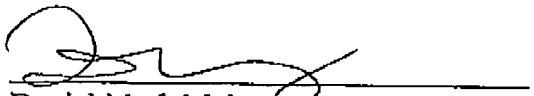
23. With respect to Kuhlman, Kuhlman does not supply the necessary motivation to alter Fe and Si ranges, as its teachings are limited to a comparison of pre-forged and non-pre-forged thick plate products. Kuhlman does not indicate that the range of Cu may be adjusted in any way upwards with respect to the teaching in Shahani, nor does it indicate what, if any, Fe and Si levels are acceptable or appropriate for the 7055 alloy.

24. At best, the teachings of Kuhlman with respect to forging techniques would be understood to contradict and teach away from the teachings of Hunt'377, if not also Shahani.

25. Therefore, Applicants respectfully request withdrawal of the rejection based on Shahani read in light of Kuhlman, and the timely allowance of the present application. Applicant also respectfully submit that combination of Kuhlman with Hunt'377 would be improper in light of the contradictory teachings of Hunt'377.

It is respectfully submitted that the present application is in condition for allowance. If the Examiner would like to suggest changes of a formal nature to place this application in better condition for allowance, a telephone call to Applicants' undersigned attorney would be appreciated.

Respectfully submitted,



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